

Phosphorus Control Plan - Permit Year 4

(Charles River/ Lakes and Ponds)

For compliance with the National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts

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Introduction

This document has been developed to satisfy the Phosphorus Control Plan (PCP) related requirements for Permit Year (PY) 4 outlined in the National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 permit). These requirements are included in the following sections of the MS4 permit:

- Appendix F, Section A.I Charles River Watershed Phosphorus TMDL Requirements
- Section 5.0 Non-Traditional MS4s, Subsection 5.1.5 Discharges Subject to Appendix F Part A.I
- Appendix F, Section A.II Lake and Pond Phosphorus TMDL Requirements

This document summarizes the requirements and the Massachusetts Department of Conservation and Recreation's (DCR's) compliance with these requirements. Section 2 addresses requirements pertaining to the Charles River Watershed (the first two bullets above) while Section 3 addresses requirements pertaining to the Lakes and Ponds Watersheds (the third bullet above).

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Charles River Watershed

Appendix F Section A.I.1.a.3 requires that by PY 4 permittees define the:

- Scope of PCP (PCP Area)
- Baseline Phosphorus Load
- Phosphorus Reduction Requirement
- Allowable Phosphorus Load

Additionally, Section 5.1.5 of the MS4 permit requires that non-traditional permittees in the Charles River Watershed coordinate with the municipality that the MS4 permittee is located within. As a part of this coordination, the non-traditional permittee must report on the following in the PY 4 Annual Report:

- Estimated current impervious area of non-traditional permittee owned property
- Land use information for non-traditional permittee owned property
- Phosphorus removal in pounds per year for any structural BMP owned by the non-traditional permittee, calculated in accordance with Appendix F Attachment 3
- Date of last maintenance activity for all structural BMPs for which phosphorus removal is calculated

Each of these requirements are reviewed below in more detail followed by a section describing DCR's compliance approach.

1. **Requirement: Define scope of PCP.** The MS4 permit allows the permittee to choose to implement the PCP within its municipal/ agency jurisdiction or only within the urbanized portion of the permittee's jurisdiction within the Charles River Watershed.

DCR Response. DCR chooses to implement the Charles River PCP within the urbanized portion of its jurisdiction. In addition, DCR has reviewed its facilities within the Charles River Watershed to determine which portions constitute an MS4 system. The approach to this determination is

documented in Section 2.2.2 of DCR's Methods for PCP & NSIR Development.¹ DCR has included a geodatabase as part of this submission which contains a layer named "DCR_PCP_Areas." This layer contains DCR's facilities within the Charles River Watershed and has attributes that distinguish which facility, or portion of a facility, constitutes DCR's MS4. Specifically, the attribute table field "Regulated Status" indicates the locations of DCR's MS4. DCR chooses to implement the Charles River PCP only within defined regulated MS4 areas.

2. **Requirements: Define the baseline phosphorus load, the phosphorus reduction requirement, and the allowable phosphorus load.** Regarding the baseline phosphorus load, the MS4 permit's Appendix F states, "The Permittee may submit more accurate land use data from 2005, which is the year chosen as the baseline land use for the purposes of permit compliance, for EPA to recalculate baseline phosphorus stormwater loads for use in future permit reissuances. Updated land use maps, land areas, characteristics, and MS4 area and catchment delineations shall be submitted to EPA along with the year 4 annual report in electronic GIS data layer form for consideration for future permit requirements.⁵ Until such a time as future permit requirements reflect information submitted in the year 4 annual report, the permittee shall use the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load Table F-2 (if its PCP Area is the permittee's entire jurisdiction) or Table F-3 (if its PCP Area is the regulated area only) to calculate compliance with milestones for Phase 1, 2, and 3 of the PCP.

[5] This submission is optional and needs only be done if the permittee has more accurate land use information from 2005 than information provided by MassGIS (<http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/lus2005.html>, retrieved 10/1/2013) or the permittee has updated MS4 drainage area characteristics and the permittee would like to update the Baseline Phosphorus Load."

DCR Response. Table 1 provides DCR's baseline phosphorus load, phosphorus reduction requirement, and allowable phosphorus load. Two estimates are presented for each parameter—one that is given in Appendix F and one that DCR has recalculated according to more accurate land use data, as Appendix F allows.

Table 1 Charles River Watershed Baseline Load Summary

Source	Total Area (ac)	Regulated Area (ac)	Baseline Load (kg/yr)	Required Reduction (kg/yr)	Allowable Load (kg/yr)	Percent Reduction (%)
MS4 Appendix F*	Not provided	Not provided	396	89	307	22
DCR Recalculation	5,368	1,266	93	47	46	51

* From Table F-3: Baseline Phosphorus Load, Phosphorus Reduction Requirement, Allowable Phosphorus Load, and Percent Reduction in Phosphorus Load from Charles River Watershed. For use when PCP Area is chosen to be only the urbanized area portion of a permittee's jurisdiction within the Charles River Watershed.

¹ See Methods for PCP & NSIR Development at [DCR Stormwater Management | Mass.gov](#)

DCR has reviewed its properties within the Charles River Watershed with the MassGIS Impervious Cover (2005) and Land Use (2005) layers.^{2,3} DCR reviewed the impervious cover and land use datasets for consistency by comparing them to MassGIS 2019 aerial imagery.⁴ If discrepancies were identified using the 2019 aerial imagery, Google Earth historic imagery was referenced to evaluate whether the discrepancy was due to changes in land use or impervious cover that had occurred since 2005, or if the discrepancy was due to an erroneous assessment of land use or impervious cover, in which case adjustment was warranted. All adjustments of the impervious cover and land use layers were relatively minor. This analysis provides an updated 2005 baseline for use in future permit nutrient load calculations.

DCR has included a geodatabase as part of this submission including layers named "DCR_PCP_LandUseEdits" and "DCR_PCP_ICEdits" which document the areas of adjusted baseline land use and impervious cover, respectively, when comparing aerial imagery to the MassGIS layers. For the land use changes, please see the attributes fields "Land Use Code (Original)" and "Land Use Code (Updated)" to see the revisions. For the impervious cover changes, please see the attribute field "Revision Type" to understand whether an area was added or removed to the impervious cover layer.

As mentioned, this geodatabase also includes a spatial layer named "DCR_PCP_Areas" which includes DCR's facilities within the Charles River Watershed and distinguishes (in the "Regulated Status" attribute field) which facility or portion of facility constitutes DCR's MS4.

This requirement asks for catchment delineations and DCR has defined catchments to support the Illicit Discharge Detection and Elimination (IDDE) requirements which can be found in DCR's IDDE webmap included in its annual report.⁵ These catchments were not used for this PCP analysis since they are based on an outfall scale which does not necessarily best support load calculations. However, larger-scale catchments were delineated to support PCP load calculations. These catchments are represented as polygons in the "DCR_PCP_Areas" layer that is included in the geodatabase submission mentioned previously.

Although the adjustments of IC and land use were relatively minor, the development of DCR's facility mapping and regulated MS4 status represents a larger update to the data likely used by EPA to calculate baseline pollutant loads and pollutant reduction targets. DCR developed a MS4 facilities layer in 2019 for the purposes of MS4 compliance, after the MS4 permit was released, and it is not clear how EPA defined DCR-owned properties during MS4 permit development. DCR recalculated the baseline loads using the developed MS4 facility layer and EPA methodology, which is based on DCR's land use, impervious cover, and hydrologic soil group of DCR's MS4 regulated area. DCR's target load and percent reductions were then calculated based on land use and watershed (Upper Charles vs. Lower Charles), consistent with EPA's approach and the Charles River TMDLs. DCR's calculation approach is outlined in the document, Methods for PCP & NSIR Development, Section 3.2 (baseline loads) and Section 3.4 (target reductions).

2 MassGIS. "Impervious Surfaces 2005." Commonwealth of Massachusetts. (February 2007). <https://www.mass.gov/info-details/massgis-data-impervious-surface-2005>

3 MassGIS. "Land Use (2005)." Commonwealth of Massachusetts. (June 2009). <https://www.mass.gov/info-details/massgis-data-land-use-2005>

4 MassGIS. "2019 Aerial Imagery." Commonwealth of Massachusetts. (Spring 2019). <https://www.mass.gov/info-details/massgis-data-2019-aerial-imagery>

5 <https://vzb.maps.arcgis.com/apps/webappviewer/index.html?id=87a35a2683aa4478a07ade7ffb7c1b2a>

Table 1 shows the baseline load values included in the MS4 Appendix F and the values recalculated by DCR using the updated DCR mapping and data. When comparing the recalculated regulated baseline load and required reductions to the MS4 Permit, the recalculated values show lower baseline load and required reduction but higher percent reduction. These differences are presumably due to the development of the DCR facility layer and evaluation of regulated status. Several DCR properties within the Charles River watershed that were determined to be unregulated MS4 areas are forested land use which has a 0% reduction target. These areas were not included in the DCR's load and target recalculation but may have been included in EPA's calculations, resulting in EPA's total baseline load higher and percent reduction lower. DCR understands that until future permit requirements reflect this information, DCR should use the MS4 permit values.

3. **Requirement: Coordinate with municipalities on planned phosphorus reduction activities.**
Section 5.1.5 of the permit requires that non-traditional permittees shall indicate planned phosphorus reduction activities on site and coordinate progress with the municipalities in each annual report.

DCR Response. DCR is in the process of planning its phosphorus reduction strategies, including non-structural activities, such as street sweeping, and structural activities, such as establishing impervious cover disconnection and infiltration BMPs. Structural BMPs will be implemented through both planned construction projects and potential stand-alone retrofits. These strategies will be developed further in Permit Year 5 and presented in the Permit Year 5 PCP submittal.

Unlike other non-traditional permittees in the Charles River Watershed, DCR has a baseline phosphorus load that is not included in municipal baseline loads, since the EPA calculated DCR's baseline load separately when calculating municipal loads for Appendix F. That said, DCR's PCP submittal will be shared with the Charles River municipalities that DCR facilities reside within.

4. **Requirement: Report on the estimated current impervious area of non-traditional permittee owned property.**

DCR Response. DCR MS4 regulated property in the Charles River Watershed contains 592 acres of impervious area based on the MassGIS Impervious Cover layer (2005)⁶, adjusted per DCR review, as described previously. Additionally, impervious cover information for DCR's facilities within the Charles River Watershed is presented in the geodatabase included as part of this submission within the layer named "DCR_PCP_ICEdits."

5. **Requirement: Report on the land use information for non-traditional permittee owned property.**

DCR Response. DCR's land use information for its varied facilities within the Charles River Watershed is presented in the geodatabase included as part of this submission within the layer named "DCR_PCP_LandUseEdits". This layer reflects the MassGIS Land Use layer (2005)⁷ for DCR facilities, adjusted as necessary based on DCR review, as described previously.

⁶ MassGIS. "Impervious Surfaces 2005." Commonwealth of Massachusetts. (February 2007).
<https://www.mass.gov/info-details/massgis-data-impervious-surface-2005>

⁷ MassGIS. "Land Use (2005)." Commonwealth of Massachusetts. (June 2009).
<https://www.mass.gov/info-details/massgis-data-land-use-2005>

6. Requirement: Report phosphorus removal in pounds per year for any structural BMP owned by the non-traditional permittee, calculated in accordance with Appendix F Attachment 3.

DCR Response. DCR has included a geodatabase as part of this submittal including two layers named "DCR_SubsurfaceBMP_Charles" and "DCR_SurfaceBMP_Charles," which document existing BMPs currently identified within DCR's facilities and included within DCR's tracking and accounting system. For the phosphorus removal for each BMP (in pounds per year), please see the attribute field "RED_P". These values represent preliminary estimates of the phosphorus removal of each BMP based on desktop delineations of contributing drainage areas and approximation of design storage volumes of each BMP, used with the baseline load calculation and BMP performance curves in Appendix F.

7. Requirement: Report date of last maintenance activity for all structural BMPs for which phosphorus removal is calculated.

DCR Response. DCR has included a geodatabase as part of this submission including two layers named "DCR_SubsurfaceBMP_Charles" and "DCR_SurfaceBMP_Charles," which document existing BMPs within DCR's facilities that have been currently identified and included within DCR's tracking and accounting system. For the date of last maintenance activity for each BMP, please see the attribute field "LAST_MAINTENANCE_DATE". There is also an attribute field called "MAINTENANCE_TYPE" that specifies the type of maintenance. Note that not all BMPs in the geodatabase have a last maintenance date populated. In some cases, this is because the BMPs were inspected and no maintenance was required, or they were inspected and are currently awaiting maintenance. DCR is working on improving the process for scheduling inspections and maintenance and is refining the geodatabase that tracks these activities. These improvements will allow DCR to report on BMP maintenance activities more accurately in future permit years.

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Lakes and Ponds Watershed

Appendix F Section A.II.1.i.c requires permittees within the Lakes and Ponds watersheds to define the:

- Scope of Lakes PCP (LPCP Area)
 - Baseline Phosphorus Load
 - Phosphorus Reduction Requirement
 - Allowable Phosphorus Load
1. **Requirement: Define scope of PCP.** Appendix F Section A.II.1.i.c item 3 requires permittees to define the LPCP Scope by the end of Permit Year 4. Similar to the Charles River PCP requirements, this includes indicating whether the permittee chooses to implement the PCP within its entire jurisdiction or only within the urbanized portion of its jurisdiction within the respective Lakes and Ponds watersheds.

DCR Response: DCR chooses to implement the Lakes and Ponds PCPs within the urbanized portion of its jurisdiction. In addition, DCR has reviewed its facilities within the Lakes and Ponds watersheds to determine which portions constitute a MS4 system. The approach to this determination is documented in Section 2.2.2 of DCR's Methods for PCP & NSIR Development. DCR chooses to implement the LPCPs only within these defined regulated MS4 areas. This results in the following Lakes and Ponds watersheds containing DCR regulated MS4 systems:

- Auburn Pond / Leesville Pond
- Bents Pond / Ramsdall Pond
- Lake Quinsigamond / Flint Pond

The geodatabase included as part of this submission includes the layer, "DCR_PCP_Areas." This layer is comprised of DCR's facilities within the Lakes and Ponds watersheds and has attributes that distinguish which facility or portion of facility constitutes DCR's MS4. Specifically, the attribute table field "Regulated Status" indicates the locations of DCR's MS4.

The following Lakes and Ponds watersheds contain DCR facilities but do not contain areas that constitute DCR regulated MS4:

- Lake Boon
- Quaboag Pond
- Greenwood Pond 2
- Lake Denison
- Bourne-Hadley Pond
- Hilchey Pond
- Whitney Pond
- Shirley Street Pond
- Newton Pond
- Lake Warner
- Long Pond
- Sugden Reservoir
- Lowes Pond
- Robinson Pond
- Greenville Pond
- Cedar Meadow Pond
- Rochdale Pond
- Texas Pond
- Quacumquasit Pond

2. **Requirements: Define the baseline phosphorus load, the phosphorus reduction requirement, and the allowable phosphorus load.** Appendix F section A.II.1.c table item number 4 requires calculating the baseline phosphorus load, the phosphorus reduction requirement, and the allowable phosphorus load by PY 4. According to the permit, baseline phosphorus load and phosphorus reduction requirement calculations should be estimated using land use phosphorus export coefficients in Attachment 1 to Appendix F and percent phosphorus reductions required from urban stormwater consistent with the TMDL of each impaired waterbody presented in Table F-6.

DCR Response: Table 2 provides DCR's baseline phosphorus load, phosphorus reduction requirement, and allowable phosphorus load for each LPCP watershed containing DCR MS4 regulated area. DCR calculated these estimates following the guidance in the MS4 permit Attachment 1 to Appendix F as outlined in DCR's Methods for PCP & NSIR Development, specifically Section 3.2 (baseline loads) and Section 3.4 (target reductions).

Table 2 Lakes and Ponds Watershed Baseline Phosphorus Load Summary

Water Body	Baseline Load (lb/yr)	Percent Reduction (per Appendix F)	Required Reduction (lb/yr)	Allowable Load (lb/yr)
Bents Pond / Ramsdall Pond	1.5	52% / 49%	0.8 / 0.7	0.7 / 0.8
Auburn Pond / Leesville Pond	3.8	24% / 31%	0.9 / 1.2	2.9 / 2.6
Lake Quinsigamond & Flint Pond	17.0	49%	8.3	8.7